

Patent claims

1. A method for machining spectacle lenses by means of a CNC-controlled spectacle lens machining apparatus, having the following steps:

- inputting the optometric data of the spectacle wearer, that is to say dioptric number, values and angles of a cylindrical or prismatic cut, intensity and position of a reading portion, into a computer which cooperates with a control device of the apparatus,

- inputting the eye's viewing point (PD values) of the spectacle wearer into the computer (by means of a selected spectacle frame),

- inputting the shape data of a selected spectacle frame, if appropriate of the profile, the shape and the circumference of a bevel groove of the spectacle frame or of a spectacle lens groove or a spectacle lens dubbed corner, corresponding to the spectacle frame, into the computer,

- inputting the spectacle lens material, that is to say silicate glass or plastic such as CR39 or polycarbonate, into the computer,

- calculating [the required rough-cast lens diameter] in the computer and displaying the rough-cast lens diameter, *from what?*

- inserting a rough-cast lens of [the desired diameter] into the apparatus,

- if appropriate, calculating the profile of a bevel, a groove or a dubbed corner on the shaped spectacle lens from at least one of the following parameters: optometric data, PD values, shape data, radii of the front surface and rear surface and the center thickness of the spectacle lens, and

- CNC-controlled machining of the rough-cast lens, which comprises at least shaping the spectacle lens and, if appropriate, also machining a bevel, a spectacle lens groove or a spectacle lens dubbed corner, if appropriate also machining the optical surface(s).

2. The method as claimed in claim 1, having the additional step of:

- incorporating correction values by calculation in [the machining data] before the CNC-controlled machining of the rough-cast lens as a function of prescribed machining tolerances, workpiece tolerances and tool tolerances and detected deviations.

3. The method as claimed in claim 1 ~~or 2~~, having the additional steps of:

- checking the position of the rough-cast lens inserted into the apparatus, and

- incorporating the position of the rough-cast lens by calculation in [the machining data].

4. The method as claimed in claim 1, ~~2 or 3~~, having the additional steps of:

- comparing the shape of the bevel groove in the selected spectacle frame with the shape of the bevel groove in a spectacle lens edging tool in the apparatus, and

- deciding by computation whether the machining of the bevel is or is not possible without or with taking (?) account of correction values by computer.

a 5. The method as claimed in claim 3 ~~or 4~~, in which there are performed on a screen a monitoring display of the input values and of the required rough-cast lens diameter, and a positionally accurate imaging of the rough-cast lens and, superimposed thereon, of the shape of the spectacle lens.

a 6. The method as claimed in claim 4 ~~or 5~~, in which there are performed on a screen imaging and assignment of the bevel groove in the spectacle frame and the bevel, produced from the bevel groove in the spectacle lens machining tool, on the circumference of the spectacle lens. }

a 7. The method as claimed in ~~one of claims 1 to 6~~ ^{Claim 1} in which the inputting of [the data required for the spectacle lens machining] is performed in machine-readable form.

8. The method as claimed in claim 7, in which the required data are stored at least partially on at least one data medium such as a magnetic strip card, bar code card or card with a CD element or a floppy disk.

a 9. The method as claimed in ~~one of claims 1 to 8~~ ^{Claim 1} in which the PD values are determined by an automatic video recording system, (and the data are led to the computer).

a 10. The method as claimed in ~~one of claims 1 to 9~~^{Claim 1}, in which the shape data of a selected spectacle frame, including the bevel profile, the bevel shape and the circumference are determined in a contactless fashion in a scanning device (and led to the computer).

a 11. The method as claimed in ~~one of claims 1 to 10~~^{Claim 1}, in which the dimensions and the shape of the bevel groove in the spectacle lens edging tool are determined in a contactless fashion by a video recording system or laser scanner system, and (the data are led to the computer).

a 12. The method as claimed in ~~one of claims 1 to 11~~^{Claim 1}, in which the profile of the front edge and of the rear edge of a shaped spectacle lens in the apparatus is scanned in a contactless fashion by a video recording system or a laser scanner system, and the data (are led to the computer) and therefrom the profile of a bevel suitable for the selected spectacle frame is calculated in the computer and used to control the bevel machining.

a 13. The method as claimed in ~~one of claims 1 to 11~~^{Claim 1}, in which the profile of the front edge and of the rear edge of a spectacle lens shape corresponding to a selected spectacle frame are calculated by the computer using at least one of the parameters of: optometric data, PD values, shape data, radii of the front surface and rear surface and the center thickness, and therefrom the profile of a bevel suitable for

the selected spectacle frame is calculated and used to control the bevel machining.

14. The method as claimed in claim 13, in which the profile of the front edge and of the rear edge is calculated from the radii of the front surface and rear surface along with the center thickness, and/or is taken over from a computer for the surface machining.

Claim 1
15. The method as claimed in ~~one of claims 1 to 14~~, in which the input and calculated data are conveyed to a spectacle lens manufacturer as order data for the rough-cast lens by long-distance data transmission.

Claim 1
16. The method as claimed in ~~one of claims 1 to 15~~, in which the input and calculated data are conveyed to a spectacle lens manufacturer as order data for the finally machined spectacle lens by means of long-distance data transmission.

17. The method as claimed in claim 15, in which the ordered and delivered rough-cast lens is finally machined in a spectacle lens machining apparatus connected to the control device.

18. The spectacle lens machining apparatus for carrying out the method as claimed in claim 7 having

- a housing (1),
- a machining chamber (2) in the housing (1),
- a spectacle lens holding shaft (5, 6) and a machining device (3) in the chamber (2),

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CLAIM 18.

- a computer connected to a control device (18) for controlling the machining of a rough-cast lens (9), held by the spectacle lens holding shaft (5, 6), by means of the machining device (3),

- an input keyboard (19) connected to the computer, and

- a data reading device (20), connected to the computer, for data for the spectacle lens machining which are stored on a data medium card, such as a magnetic strip card, bar code card or card with a CD element.

19. The spectacle lens machining apparatus as claimed in claim 18, having a floppy disk drive (21), connected to the computer, for data, stored on a floppy disk, for the spectacle lens machining.

20. The spectacle lens machining apparatus as claimed in claim 18 ~~or 19~~, having a scanning device (22), connected to the computer, for the spectacle lens opening in a selected spectacle frame as well as for the profile, the cross-sectional shape and the circumference of a bevel groove in the spectacle frame.

21. The spectacle lens machining apparatus as claimed in claim 18, ~~19 or 20~~, having a sensor (23), connected to the computer, for detecting characterizing markings on a rough-cast lens, on packaging for a rough-cast lens or a storage container for rough-cast lenses and/or on a spectacle frame,

packaging for a spectacle frame or on a storage container for a spectacle frame.

a 22. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 21~~, having a video recording system (28),
1 connected to the computer, for automatically recording the PD values of the spectacle wearer with reference to a selected spectacle frame.

a 23. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 22~~, having a vertex refractionometer,
1 connected to the computer, for automatically recording the optical values of a shaped spectacle lens or a rough-cast lens.

a 24. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 23~~, having a device, connected to the
1 computer, for mounting a block or sucker on a rough-cast lens or a shaped spectacle lens, and for automatically transmitting the position of the block or sucker on the rough-cast lens or the shaped spectacle lens to the computer.

a 25. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 24~~, having a detection device (10, 11;
1 24), connected to the computer, for the position of a lens (9), which is to be machined, with reference to the spectacle lens holding shaft (5, 6).

a 26. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 25~~, having a detection device (24),
1 connected to the computer, for the diameter of a rough-cast

lens (9), held in the spectacle lens holding shaft (5, 6), and/or for the profile of the front edge and the rear edge of the circumference of a shaped spectacle lens.

a 27. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 26~~, having a detection device (25),
1 connected to the computer, for the shape and the dimensions of a bevel groove (12) in a spectacle lens edging tool (3).

a 28. The spectacle lens machining apparatus as claimed in ^{Claim 25} ~~one of claims 25, 26 or 27~~, having a detection device (10;
1 24; 25) consisting of a CCD camera.

a 29. The spectacle lens machining apparatus as claimed in ^{Claim 18} ~~one of claims 18 to 28~~, having a screen (14), connected to
1 the computer, for displaying the input data and/or for imaging the rough-cast lens (9) with the required diameter and/or the spectacle lens, which is aligned in [the correct position] with reference to the rough-cast lens and is to be shaped, and/or the bevel-groove cross section of a selected spectacle frame, as well as the bevel, resulting from the dimensions and the shape of the bevel groove of [the spectacle lens edging tool], of a spectacle lens to be shaped.

a 30. ^{Claim 18} The spectacle lens machining apparatus as claimed in ~~claims 18 to 29~~,
1 having an input keyboard which has only a switch-onkey, a start key, an interruption key for the running machining operation, a stop key and, if appropriate, a key for controlling an aftercut.

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